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Proposed New Procedure for Estimating Allowable Number of Rounds for Blast Overpressure Hazard Assessment

By

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Current procedures for health hazard assessment of weapons blast overpressure use criteria contained in MIL-STD-1474D. These criteria are applied to the test data so that the single pressure-time signature which indicates the greatest hazard (worst case round) is used to derive the recommended firing restrictions for the system. This approach is conservative and probably overrestricts the use of the system. Since it is based on the worst case round, the rest of the test data are essentially ignored in the hazard assessment. A procedure to establish recommended firing limits using all of the data has been developed. The procedure is based on accumulating hazards over the test data set until the criterion value is reached. This establishes the allowable number of rounds. A maximum exposure level for the worst case round is retained to prevent injury from single round exposures. Two variations of the basic procedure are explored and numerical examples of each are presented. The procedure implemented using a proportional dose accumulation is recommended.

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Table of contents

Introduction

The health hazard assessment process for blast overpressure (BOP) is based primarily on the impulse noise sections of MIL-STD-1474D. It establishes both test requirements and maximum safe exposures conditions for impulse noise. Test plans are usually developed to include a variety of test conditions which are representative of the operational use of the systems. The use of these data in the hazard assessment process involves finding the "worst case" test round for each test condition for each personnel occupied area. Then the test conditions are categorized into those for which a hazard assessment will be applied (i.e., propelling charge or type of round) and those which will be lumped together because they cannot be adequately controlled in the operational environment. The types of test conditions that are commonly lumped are quadrant elevation (QE), azimuth (AZ), and temperature of the test rounds. These variables are included in the test plans to ensure the full range of these variables is represented in the final data set because they can have a significant effect on the BOP levels. The process for lumping these conditions is to find the worst case condition and use it to assess all the conditions. For example, at least three QEs are typically included in an artillery system test, a low elevation, a nearly maximum elevation, and a maximum range elevation. The test round from the QE which produces the highest level in the crew areas would be used for all QEs. Azimuth and temperature conditioning of the propelling charges are treated in an analogous manner. Thus, the worst case round from all the rounds and firing conditions is used to assess the hazard. Notice that "round" is singular. For an assessable unit such as a propelling charge in an artillery system, one round out of 30 to 40 test rounds will determine the recommended firing limits (allowable number of rounds (ANR)) per day for that propelling charge.

This "worst case" approach to hazard assessment has been in use for many years. It is based on the fact that one round, if it produces intense enough BOP, can produce injury to either auditory or nonauditory organs. The leading alternative approach is to use the average levels instead of the worst case levels. While averaging is commonly used to induce statistical stability in data sets, its use in this context carries an implication that somehow after exposure to an excessive blast, further exposure to lesser blasts will mitigate the effects of the large blast. Experience has shown that some artillery and mortar systems produce occasional blast levels which exceed the average by a substantial amount. This presents the real possibility that the average level could appear safe for some number of rounds while the worst level is capable of producing injury in a single blast. This reasoning highlights the need to continue to guard against occasional excessive exposures. In addition, there are some empirical data showing that exposure to a series of impulses in which a small percentage of the impulses is well above the average, causes hearing loss greater than when the exposure to impulses is all at the same average level (Patterson *et al.*, 1991). These factors have resulted in the continued use of the "worst case" approach to hazard assessment.

On the other side of this dilemma, operational limitations on a weapon system are based on a single test round. For purposes of a health hazard assessment (HHA), the system is treated as if all rounds will result in exposures to this worst case measured level. Once the worst case round

is identified, the rest of the data are essentially ignored. For systems whose worst case levels are not beyond acceptable limits but lead to a recommended limit of only a small number of rounds, the use of the worst case analysis may be overly restrictive. For systems which exhibit considerable round-to-round variability, this can lead to severe restrictions on numbers of rounds allowed for training.

The worst case round is a statistically fickle quantity. Its statistical properties depend heavily on the number of rounds fired during test. The statistical problems with the small number of rounds per condition could be resolved by simply requiring more rounds per condition. If a large number of test rounds could be fired for each condition, more sophisticated and more stable statistical properties could be used in the HHA. However, the cost per round in testing is very high and a requirement of 20 to 30 rounds per condition would be exorbitant for the number of conditions which need to be evaluated. As a matter of practicality, firing a large number of rounds in a blast test is prohibited by cost. As a result, there is some effort expended to minimize the number of test rounds. One of the requirements in MIL-STD-1474D is that the minimum number of test rounds fired per test condition is three or a number which is equal to the range of peak pressure levels in dB plus 1. This could lead to open-ended test plans since the number of rounds required is not known until after they have been fired. In practice, a typical test plan will call for five rounds under each firing condition. In effect, the gamble is that the range of peak levels will be less than 4 dB. The test to determine whether the number of rounds exceeds the range of levels is almost never applied since the data are not scored until long after the test data collection is complete. As a result, a typical set of test data consists of five rounds per firing condition, and five is a statistically small number. (The highest level in a sample of five defines a 97 percent confidence upper bound on the median level.) The use of this worst case round can lead to an overly conservative hazard assessment.

This report describes new HHA procedures which will require a minimal increase in the number of test rounds required, protect against excessive one round exposures, and utilize more of the test data to establish recommended firing restrictions when the single round exposures are not excessive.

Proposed procedures

This proposal is intended to overcome the shortcomings of the worst case approach while maintaining reasonable protection against single round hazardous exposures. The essence of the procedure is to maximize the number of rounds available by lumping together all the conditions that are currently lumped, e.g., QE, AZ, temperature, etc. Then, the lumped data are rank ordered by their hazard indicator. The worst case round will be at the top of this list (the same round that would have determined the entire analysis under the current scheme). The hazard indicator for this round is compared to a limit criterion. If it exceeds the limit, there is potential for injury on a single round and the recommendation is that no firing be permitted. If it is below the limit, then an accumulation process begins. The rounds with the highest and second highest hazard

indicators are cumulated together and compared to the limit criterion. This accumulation is continued until the accumulated hazard indicators exceed the limit criterion or until all the data are used. If the limit is exceeded before the rank ordered list is exhausted, the ANR is the maximum ordered round number for which the accumulated hazard indicator does not exceed the limit. If all rounds on the list are exhausted and the limit has not been reached, the accumulation continues by starting at the top of the list again and continuing this iteration until the limit is reached. The ANR then becomes the total number of rounds in the accumulation process before the limit is exceeded.

In order to assure enough data are available, it will be necessary to require at least five rounds per test condition as has become common practice. If there are enough test conditions for which the data can be lumped for the total number of test rounds to be 25 or more, then the number of rounds per condition can be five. Otherwise, the number of rounds per condition will have to be increased so that the total number of rounds from conditions that can be combined is greater than 25. (This requirement should add very few test rounds to a typical weapon system test.)

There are two alternatives for the accumulation process. The first involves a proportional dose accumulation. This method assumes an established procedure such as MIL-STD-1474D for calculating ANR for any given pressure-time signature. For each test round, the ANR for that impulse is calculated using conventional procedures. This becomes the denominator in a fraction, $1/ANR_i$, for i=1 to N. This fraction becomes the proportional dose hazard indicator for that round. These hazard indicators are rank ordered from largest to smallest across all test rounds which can be lumped together. The accumulation process is a simple sum of the rank ordered fractional doses to produce the accumulated proportional dose hazard indicator (APDHI):

1] $$APDHI = \sum 1/ANR_i \quad \text{for } i = 1 \text{ to } k$$

The limit criterion is 1.0. The largest k which keeps APDHI less than 1.0 becomes the system ANR. The ANR_1 used in the first term of the APDHI would have been the system limitation under current procedures. If ANR_1 is greater than 1, then there could be two or more rounds permitted under the proposed scheme. Since the fractions $1/ANR_i$ are a decreasing series, they will not add to more than 1.0 before ANR_1 of them have been cumulated. Thus, the proposed procedure using APDHI will always result in the same number or a larger number of rounds than the worst case round procedure.

The MIL-STD-1474D currently limits exposure to the "Z-curve" which permits five rounds per day with single hearing protection. This limit can be maintained using this new procedure by setting the limit for the worst case round so that $1/ANR_1$ must be less than 0.2. After this initial condition is met, the accumulation process would be done as described. The proposed procedure will still result in at least five rounds per day for the system if the worst case round is below the Z-curve.

While this procedure would work well for the exposure limits in the current MIL-STD-1474D, they will work just as well for any set of exposure limits which can be described by equations that contain parameters extracted from a pressure-time signature and the number of rounds. In other words, all that is required is that the exposure limits lead to an equation for ANR based on parameters from the pressure-time signature. For example, consider the current MIL-STD-1474D. The exposure limits (this formulation encompasses the X-, Y-, and Z-curves and everything between) can be written as:

2] $173.5 = PPL + 6.64 \cdot \log(\text{B-duration}/200) + 5 \cdot \log(ANR/5)$ for B-duration<200ms
3] $173.5 = PPL + 5 \cdot \log(ANR/5)$ for B-duration≥200ms

Where PPL is the peak pressure level in dB SPL, B-duration is in ms and ANR ≥ 5 rounds. Given a peak level and B-duration derived from the pressure-time signature of a test round, these equations can be solved for ANR for that pressure-time signature. If ANR is set to 5, they define the Z-curve. If ANR is set to 100, they define the Y-curve. Finally, if ANR is set to 2000, they define the X-curve in MIL-STD-1474D.

An alternative way to accumulate the hazard indicator is to use an intensity summation procedure. This requires that a hazard indicator quantity be calculated from the pressure-time signature to yield pressure-time level (PTL) in dB. This quantity must have a number-intensity trading rule in the form of $b \cdot \log(N)$ which allows the adjustment of the ANR with changes in PTL. This is equivalent to a requirement that there is a limit criterion, C, such that

4] $C = PTL + b \cdot \log(N)$

Then the accumulated hazard indicator (AHI) is given by

5] $AHI = 10 \cdot \log[\sum 10^{(0.1 \cdot PTL_i)}] - (10-b) \cdot \log(k)$ for i = 1 to k

The largest k which keeps AHI below the hazard criterion, C, becomes the ANR for the system under the lumped set of conditions.

This can be illustrated by using two examples, the current MIL-STD-1474D and A-weighted sound exposure level (SEL). The limit equations for MIL-STD-1474D, given in equations 2 and 3 above, can be put into the form of equation 4. The number trading rule is $5 \cdot \log(N)$, i.e., b=5. In order to maintain the Z-curve as the maximum exposure, set N=5 and find the limit level is C = 177 dB; then, rank order the data based on the single shot hazard indicator (HI) level:

6] $HI_i = PPL_i + 6.64 \cdot \log(\text{B-duration}_i/200)$

Then calculate the AHI as

7] $AHI = 10 \cdot \log[\sum 10^{(0.1 \cdot HIL_i)}] - 5 \cdot \log(k)$ for i = 1 to k

Note that (10-b) = 5 for the MIL-STD-1474D number-intensity trading rule. In order to maintain the Z-curve limit, HIL_1, the highest hazard indicator level, must be less than 173.5 dB. Next, find the largest k such that AHI is less than 177 dB, and that is the ANR for this set of conditions.

A-weighted SEL (SEL)(A) is based on parameters which are proportional to the weighted energy in an impulse. Currently, there is no limit level based on A-weighted SEL, so simply assume one could be established; call it LL_A. The exposure limit equation is:

8] $LL_A = SEL(A) + 10 \cdot \log(N)$

The number trading rule is $10 \cdot \log(N)$ so b = 10 and the adjustment for number trading rule drops out of equation 5. Then, rank order the data based on the single shot hazard indicator $SEL_i(A)$.

9] $AHI = 10 \cdot \log[\sum 10^{(0.1 \cdot SELi(A))}]$ for i = 1 to k

Notice the number of impulses adjustment is zero since it is used to account for number trading rules that are different from the $10 \cdot \log(N)$ rule implicit in SEL(A). Then, find the largest k such that AHI is less than LL_A, and that is the ANR for this set of conditions.

Data are normally collected at a number of locations selected by the anticipated locations of personnel operating the system. The above calculations are applied to each position monitored, and the smallest ANR among the positions is used as the final recommendation for firing limits.

Numerical examples

Three examples were taken from a subset of data from a 155mm towed howitzer. Data from two propelling charges, M203A1 and M4A2, zone 7, were selected. Only data from the two positions which showed the most severe exposures were included in order to simplify the examples. The worst case round MIL-STD-1474D rules were used to compare the current recommended firing restrictions with those that would result if the proposed procedures were adopted without any other changes to the standard. In addition, the average peak level and B-duration were used to calculate an ANR based on average values.

Example 1 was the M203A1 charge. The round-by-round data are in appendix A, table A-1. The test included 10 rounds at 300 mils QE, 13 rounds at 950 mils QE, and 7 rounds at 1210 mils QE. All rounds were fired with the cannon at center traverse. Appendix A also contains the rank ordered ANRs and the APDHI derived from these data for each of the two positions in table A-2. The first entry in this table for each position represents the worst case round at that position. Position 1 shows a smaller ANR which is rounded down to five rounds per day. This would be the conventional MIL-STD-1474D firing limit based on these data. The APDHI exceeded 1.0 at the 13th round for position 1, and at the 16th round for position 2. Thus, 12 rounds would be the

recommended firing limit using the APDHI method. Finally, appendix A, table A-3, shows the rank ordered hazard indicator (HI) in dB and the AHI derived from these data. The AHI reached 177 dB at 13 and 16 rounds, respectively, for the two positions. The table below summarizes the recommended firing limits for this propelling charge based on current MIL-STD-1474D procedures, the APDHI, and the AHI. The average peak level and B-duration were used to calculate the ANR using the MIL-STD-1474D equations. The average level limits are also shown in the table.

Table
Comparison of exposure limits in allowable number of rounds per day derived by four procedures.

Propelling charge	MIL-STD-1474 worst case limit	APDHI limit	AHI limit	Average level limit
M203A1	5	12	13	22
M4A2 (with flashers)	8	132	277	406
M4A2 (without flashers)	228	482	495	525

Example 2 was taken from the M4A2, zone 7 data from the same howitzer. The round-by-round data are contained in appendix B, table B-1. The data included three QEs and two AZs. The complete set of M4A2 data included conditions in which the round-to-round variability was high due to secondary detonations near the muzzle (flashers). The left traverse data and the center traverse data were combined to produce the largest set of data which could be used to assess the M4A2 charge. Table 1 summarizes the ANR derived by the four procedures.

Table B-2 shows the rank ordered ANR and APDHI for the full set of M4A2 data. Only one cycle of accumulation is shown since the ANR based on APDHI can be easily derived from one cycle of the APDHI from all the data. The APDHI for position 1 was only 0.1837 after all 34 rounds had been used in the accumulation. Thus, it would require five complete repetitions of the accumulation through the data set to reach 0.9185. Adding the first round to this would bring the accumulation to 0.9834. But adding the first two rounds would make the total 1.0227. So the ANR for position 1 is 171 (5*34+1). For position 2, the accumulated total for all 33 rounds was 0.2228. After four complete cycles, this total was 0.8912. Adding the first round to this would yield 1.0159. Thus, the ANR for position 2 was 132 (4*33+0).

Table B-3 shows the rank ordered HI and AHI. Unlike the APDHI, AHI is a nonlinear accumulation and, therefore, the sequential accumulation passes though the data set are shown until the AHI reaches its limit of 177 dB. This example shows a peculiar property of the AHI which was not seen in the M203A1 data. It increased over the first three rounds in the accumulation process (these were the highest levels), and then decreased or remained constant

for the next seven rounds at position 1 and 17 rounds for position 2 before it began a slow increase toward the limit. The AHI finally reached the limit on the 281st round for position 1 and the 277th round for position 2. Position 2 then established the ANR.

Example 3 was based on the same data from the M4A2, zone 7, used in example 2. The rounds which had the secondary explosions were removed from the data set to produce a data set which is more typical of a well-behaved system. The round-by-round data are contained in appendix C, table C-1. The table in the text (M4A2, nonflash) summarizes the ANR derived by the four procedures.

Table C-2 shows the rank ordered ANR and APDHI for this set of M4A2 data. Again, only one cycle of accumulation is shown since the ANR based on APDHI can be easily derived from one cycle of the APDHI from all the data. The APDHI for position 1 was only 0.0637 after all 31 rounds had been used in the accumulation. Thus, it would require 15 complete repeats of the accumulation through the data set to reach 0.9555. Adding the first 17 rounds to this would bring the accumulation to 0.9996. But, adding the first 18 rounds would make the total 1.0013. So the ANR for position 1 is 482 (15*31+17). For position 2, the accumulated total for all 33 rounds was 0.0551. After 18 complete cycles, this total was 0.9918. Adding the first two rounds to this would yield .9987. Adding the first three rounds to this would yield 1.001. Thus, the ANR for position 2 was 542 (18*30+2). The ANR for this procedure would be 482 rounds.

Table C-3 shows the rank ordered HI and AHI. Again, the sequential accumulation passes through the data set are shown until the AHI reaches its limit of 177 dB. This example does not show the decline of the AHI which was noted in example 2. It increased throughout the accumulation process for both positions. The AHI finally reached the limit on the 495th round for position 1 and the 542nd round for position 2. Position 1 then established the ANR.

Discussion

The use of the worst case round to calculate the ANR for hazard assessment is a relatively conservative approach. It protects against the possibility that an exposure could consist entirely of rounds at the same level as the worst round in the test data. It is a highly unlikely event. This conservatism comes at the price of severe restrictions on firing which are probably not warranted. In the examples shown here, the M4A2 would be restricted almost as much as the M203A1 based on the worst case round (ANR=8 vs. 5). Yet, the M203A1 was consistently high level while the M4A2 was only occasionally high level. The use of average peak level and B-duration would greatly increase the ANR for the M4A2, but provides no protection against an occasional unacceptable round.

The APDHI is a rational alternative which does have a built in protection against the occasional unacceptable round. However, it allows the distribution of levels to be used in determining the ANR. It is an intermediate step between the averaging process and the worst

case process. It has the property that each test round contributes an increment of indicated hazard based on the level of that test round. It ensures that when the ANR exceeds the number of test rounds, the higher level rounds are factored into the ANR calculation in proportion to their incidence in the set of test data, without making assumptions about the statistical distributions of the test data.

The AHI procedure has some of the advantages of the APDHI. However, the declining values of the AHI when there are a few high level rounds in the data set is a negative feature which cannot occur with the APDHI. It appears to result from the effect of the 5·log(N) correction for the number-intensity trading rule. When N is small and the incremental contribution from the low level rounds is relatively small, the decrement from subtracting 5·log(N) overwhelms the energy contributions of the low level rounds. If the number-intensity trading rule were 10·log(N), this decrement would not occur.

When we compare the ANR from the APDHI with the AHI, we find they yield similar results when the data are relatively uniform (M203A1 and the non-flash M4A2). When the data have the small number of high levels in the data set, there is a large difference between the ANR established by the two procedures. Both procedures result in substantially larger ANR than the worst case analysis.

Conclusions

Two alternative procedures for using test data to establish recommended firing restrictions as part of the HHA process have been described. Of these, the accumulated proportional dose hazard indicator has greater face validity. It gives a monotonically increasing indication of hazard across the test data. It is conceptually consistent with the current procedures for estimating hazard when different charges are combined in a firing sequence.

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Patterson, J. H., Jr., Curd, D. L., Lomba Gautier, I., Hamernik, R. P., Ahroon, W. A., Turrentine, G. A., and Hargett, C. E., Jr. 1991. Effect of impulse presentation order on hearing trauma in the chinchilla. Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. USAARL Report No. 91-21.

Appendix A.

Example 1, M203A1 data

Table A-1.
Data for M203A1 charge for two measurent positions.

	Position 1				Position 2			
QE in mils	Peak level	B-duration in ms	HI in dB	ANR	Peak level	B-duration in ms	HI in dB	ANR
300	177.2	36.8	172.3	8.6	176.4	36.8	171.5	12.5
	175.9	39.9	171.3	14.1	175.9	36.5	171.0	15.9
	176.6	35.0	171.6	12.2	175.6	35.1	170.6	19.2
	178.1	37.0	173.2	5.7	176.5	35.6	171.5	12.5
	176.8	39.5	172.1	9.5	176.3	39.5	171.6	11.9
	175.3	41.6	170.8	17.6	176.7	35.6	171.7	11.4
	174.8	40.8	170.2	22.7	174.8	39.7	170.1	23.6
	173.7	38.1	168.9	41.3	174.3	48.1	170.2	23.0
	175.1	42.4	170.6	18.8	174.1	51.9	170.2	22.8
	174.5	36.2	169.6	30.6	175.2	39.5	170.5	19.7
950	174.9	36.5	170.0	25.2	174.5	37.6	169.7	29.1
	176.0	35.6	171.0	15.7	175.8	34.4	170.7	18.0
	175.7	39.2	171.0	15.8	175.5	36.6	170.6	19.0
	175.6	37.5	170.8	17.6	175.2	37.5	170.4	21.2
	175.4	39.2	170.7	18.2	175.2	36.7	170.3	21.8
	175.6	39.7	170.9	16.3	176.2	35.9	171.2	14.1
	176.0	37.5	171.2	14.6	176.2	35.5	171.2	14.4
	174.7	40.9	170.1	23.7	173.8	42.5	169.3	34.1
	174.6	52.2	170.7	18.0	172.1	44.6	167.8	70.1
	172.7	47.3	168.5	49.2	173.5	45.7	169.2	35.6
	173.8	48.4	169.7	28.7	174.0	41.4	169.5	32.2
	175.0	39.7	170.3	21.5	172.7	42.4	168.2	56.8
	173.6	49.7	169.6	30.4	174.4	42.4	169.9	26.0
1210	173.4	43.5	169.0	39.8	175.3	41.2	170.7	17.8
	173.5	46.0	169.3	35.3	175.6	37.0	170.7	17.9
	173.2	49.2	169.2	37.1	176.0	36.3	171.1	15.3
	173.3	47.6	169.2	37.0	174.3	41.3	169.8	28.2
	172.9	47.0	168.7	45.2	174.0	39.5	169.3	34.3
	171.9	44,0	167.5	78.2	172.7	43.5	168.3	54.9
	173.8	42.5	169.3	34.1	172.9	43.9	168.5	49.5
Average	174.7	41.6	170.2	26.1	174.8	39.8	170.2	26.1

Table A-2

ANR, 1/ANR, and APDHI calculated from the M203A1 data rank ordered for increasing ANR.

Position 1				Position 2			
ANR	1/ANR	APDHI	N	ANR	1/ANR	APDHI	N
5.66	0.1765	0.1765	1	11.36	0.0880	0.0880	1
8.64	0.1158	0.2923	2	11.90	0.0840	0.1721	2
9.45	0.1058	0.3981	3	12.46	0.0803	0.2523	3
12.17	0.0822	0.4803	4	12.48	0.0801	0.3324	4
14.11	0.0708	0.5511	5	14.14	0.0707	0.4031	5
14.64	0.0683	0.6195	6	14.36	0.0697	0.4728	6
15.68	0.0638	0.6832	7	15.28	0.0654	0.5382	7
15.84	0.0631	0.7463	8	15.89	0.0629	0.6012	8
16.31	0.0613	0.8076	9	17.83	0.0561	0.6572	9
17.60	0.0568	0.8645	10	17.91	0.0558	0.7131	10
17.60	0.0568	0.9213	11	18.00	0.0556	0.7686	11
17.98	0.0556	0.9769	12	19.03	0.0525	0.8212	12
18.19	0.0550	1.0319		19.21	0.0520	0.8732	13
18.82	0.0531	1.0850		19.75	0.0506	0.9239	14
21.51	0.0465	1.1315		21.16	0.0473	0.9711	15
22.74	0.0440	1.1755		21.77	0.0459	1.0171	
23.74	0.0421	1.2176		22.80	0.0439	1.0609	
25.18	0.0397	1.2573		23.01	0.0435	1.1044	
28.73	0.0348	1.2921		23.58	0.0424	1.1468	
30.41	0.0329	1.3250		25.98	0.0385	1.1853	
30.61	0.0327	1.3577		28.17	0.0355	1.2208	
34.14	0.0293	1.3870		29.10	0.0344	1.2551	
35.29	0.0283	1.4153		32.24	0.0310	1.2862	
36.97	0.0270	1.4424		34.14	0.0293	1.3154	
37.05	0.0270	1.4693		34.32	0.0291	1.3446	
39.80	0.0251	1.4945		35.60	0.0281	1.3727	
41.33	0.0242	1.5187		49.50	0.0202	1.3929	
49.15	0.0203	1.5611		56.84	0.0176	1.4287	
78.21	0.0128	1.5739		70.06	0.0143	1.4430	
45.21	0.0221	1.5408		54.94	0.0182	1.4111	

Table A-3.

HI and AHI from M203A1 data rank ordered by descending HI.

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
173.2	173.2	1	171.7	171.7	1
172.3	174.3	2	171.6	173.2	2
172.1	175.0	3	171.5	174.0	3
171.6	175.4	4	171.5	174.6	4
171.3	175.6	5	171.2	175.0	5
171.2	175.9	6	171.2	175.4	6
171.0	176.1	7	171.1	175.6	7
171.0	176.3	8	171.0	175.9	8
170.9	176.5	9	170.7	176.1	9
170.8	176.6	10	170.7	176.3	10
170.8	176.7	11	170.7	176.4	11
170.7	176.9	12	170.6	176.6	12
170.7	177.0	13	170.6	176.7	13
170.6	177.1		170.5	176.8	14
170.3	177.2		170.4	176.9	15
170.2	177.3		170.3	177.0	16
170.1	177.3		170.2	177.1	
170.0	177.4		170.2	177.2	
169.7	177.5		170.1	177.3	
169.6	177.5		169.9	177.3	
169.6	177.6		169.8	177.4	
169.3	177.6		169.7	177.5	
169.3	177.6		169.5	177.5	
169.2	177.7		169.3	177.5	
169.2	177.7		169.3	177.6	
169.0	177.7		169.2	177.6	
168.9	177.8		168.5	177.6	
168.7	177.8		168.3	177.7	
168.5	177.8		168.2	177.7	
167.5	177.8		167.8	177.7	

Appendix B.

Example 2, M4A2 data with secondary detonations.

Table B-1.

Data for M4A2 charge for two measurent positions.

	Position 1				Position 2			
QE/AZ in mils	Peak level	B-duration in ms	HI in dB	ANR	Peak level	B-duration in ms	HI in dB	ANR
300/	169.1	36.5	164.2	364.0	168.4	41	163.8	430.5
Center	169.1	42.8	164.7	294.6	169.6	39.9	165.0	256.8
	169.7	37.7	164.9	264.5	167.8	39.9	163.2	588.4
	168.5	40	163.9	424.8	168.3	40.5	163.7	458.2
	167.3	43.7	162.9	656.5	168.7	37.4	163.9	423.6
800/	167.9	44.1	163.5	492.0	167.9	37.5	163.1	610.2
Center	175.5	42.9	171.1	15.4	173.6	43.6	169.2	36.2
	167.5	43.5	163.1	602.4	168	44.6	163.7	462.9
	167.7	42.6	163.2	564.8	167.8	45.7	163.5	491.4
	174.5	41.6	170.0	25.4	172.4	42.5	167.9	65.1
	172.4	43.5	168.0	63.1	177	41.7	172.5	8.0
	167.1	46.3	162.9	666.6	167.7	43.4	163.3	551.0
	167.7	48.4	163.6	476.8	167.9	37.1	163.0	618.9
	166.9	46.7	162.7	722.6	167.4	38.5	162.6	741.8
1250/	166.7	38.9	162.0	1010.0	167.6	43.1	163.2	582.3
Center	166.5	44.9	162.2	915.3	168	43.8	163.6	474.1
	166.6	48.5	162.5	789.0	167.6	42.7	163.1	589.6
	166.8	45.1	162.5	792.5	167.7	42.6	163.2	564.8
	166.4	39.4	161.7	1140.1	167.7	40.4	163.1	606.0
300/	167.5	45.7	163.2	564.2	166.8	44.9	162.5	797.2
L350	169.3	47.8	165.2	232.0	167.8	49.9	163.8	437.2
	168.1	48.7	164.0	393.3	Lost			
	167.2	51.6	163.3	551.3	166.9	45.8	162.6	741.5
	169.8	40.6	165.2	228.8	167.4	45	163.1	603.0
800/	167.5	40.1	162.9	671.1	167.4	44.3	163.1	615.7
L350	167.5	46.6	163.3	549.7	166.9	46.4	162.7	728.8
	167.9	47.2	163.7	449.5	167.6	45.2	163.3	546.7
	168	42	163.5	501.3	168.1	43.5	163.7	456.9
	168	40.1	163.4	533.1	168.6	45.9	164.4	338.0
1250/	167.5	47.6	163.4	534.4	167.3	48.8	163.2	567.0
L350	167.4	44.2	163.0	617.5	166.8	42.8	162.4	849.6

Table B-1 (continued).

Data for M4A2 charge for two measurent positions.

	Position 1				Position 2			
QE/AZ in mils	Peak level	B-duration in ms	HI in dB	ANR	Peak level	B-duration in ms	HI in dB	ANR
	167.4	42.3	162.9	654.6	167.3	43.1	162.9	668.6
	168.7	45.4	164.4	327.5	166.6	42.9	162.2	928.7
Average	168.3	43.9	163.9	520.2	168.3	42.9	163.8	538.5

Table B-2.
ANR, 1/ANR, and APDHI calculated from the M4A2 data
rank ordered for increasing ANR.

Position 1				Position 2			
ANR	1/ANR	APDHI	N	ANR	1/ANR	APDHI	N
15.4	0.0649	0.0649	1	8.0	0.1247	0.1247	1
25.4	0.0393	0.1042	2	36.2	0.0276	0.1523	2
63.1	0.0159	0.1200	3	65.1	0.0154	0.1677	3
228.8	0.0044	0.1244	4	256.8	0.0039	0.1716	4
232.0	0.0043	0.1287	5	338.0	0.0030	0.1745	5
264.5	0.0038	0.1325	6	423.6	0.0024	0.1769	6
294.6	0.0034	0.1359	7	430.5	0.0023	0.1792	7
327.5	0.0031	0.1389	8	437.2	0.0023	0.1815	8
364.0	0.0027	0.1417	9	456.9	0.0022	0.1837	9
393.3	0.0025	0.1442	10	458.2	0.0022	0.1859	10
424.8	0.0024	0.1466	11	462.9	0.0022	0.1880	11
449.5	0.0022	0.1488	12	474.1	0.0021	0.1901	12
476.8	0.0021	0.1509	13	491.4	0.0020	0.1922	13
492.0	0.0020	0.1529	14	546.7	0.0018	0.1940	14
501.3	0.0020	0.1549	15	551.0	0.0018	0.1958	15
533.1	0.0019	0.1568	16	564.8	0.0018	0.1976	16
534.4	0.0019	0.1587	17	567.0	0.0018	0.1994	17
549.7	0.0018	0.1605	18	582.3	0.0017	0.2011	18
551.3	0.0018	0.1623	19	588.4	0.0017	0.2028	19
564.2	0.0018	0.1641	20	589.6	0.0017	0.2045	20
564.8	0.0018	0.1659	21	603.0	0.0017	0.2061	21
597.7	0.0017	0.1675	22	606.0	0.0017	0.2078	22
602.4	0.0017	0.1692	23	610.2	0.0016	0.2094	23
617.5	0.0016	0.1708	24	615.7	0.0016	0.2110	24
654.6	0.0015	0.1723	25	618.9	0.0016	0.2127	25
656.5	0.0015	0.1739	26	668.6	0.0015	0.2142	26
666.6	0.0015	0.1754	27	728.8	0.0014	0.2155	27
671.1	0.0015	0.1769	28	741.5	0.0013	0.2169	28
722.6	0.0014	0.1782	29	741.8	0.0013	0.2182	29
789.0	0.0013	0.1795	30	797.2	0.0013	0.2195	30
792.5	0.0013	0.1808	31	849.6	0.0012	0.2207	31

Table B-2 (continued).
ANR, 1/ANR, and APDHI calculated from the M4A2 data
rank ordered for increasing ANR.

Position 1				Position 2			
ANR	1/ANR	APDHI	N	ANR	1/ANR	APDHI	N
915.3	0.0011	0.1819	32	928.7	0.0011	0.2217	32
1010.0	0.0010	0.1829	33	931.6	0.0011	0.2228	33
1140.1	0.0009	0.1837	34				

Table B-3.
HI and AHI from M4A2 data rank ordered by descending HI.

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
171.1	171.1	1	172.5	172.5	1
170.0	172.1	2	169.2	172.6	2
168.0	172.2	3	167.9	172.7	3
165.2	172.1	4	165.0	172.5	4
165.2	172.0	5	164.4	172.3	5
164.9	172.0	6	163.9	172.2	6
164.7	172.0	7	163.8	172.1	7
164.4	172.0	8	163.8	172.0	8
164.2	172.0	9	163.7	172.0	9
164.0	171.9	10	163.7	172.0	10
163.9	172.0	11	163.7	172.0	11
163.7	172.0	12	163.6	172.0	12
163.6	172.0	13	163.5	172.0	13
163.5	172.0	14	163.3	172.0	14
163.5	172.0	15	163.3	172.0	15
163.4	172.0	16	163.2	172.0	16
163.4	172.0	17	163.2	172.0	17
163.3	172.0	18	163.2	172.0	18
163.3	172.0	19	163.2	172.0	19
163.2	172.1	20	163.1	172.0	20
163.2	172.1	21	163.1	172.1	21
163.1	172.1	22	163.1	172.1	22
163.1	172.1	23	163.1	172.1	23
163.0	172.1	24	163.1	172.1	24
162.9	172.1	25	163.0	172.1	25
162.9	172.2	26	162.9	172.2	26
162.9	172.2	27	162.7	172.2	27
162.9	172.2	28	162.6	172.2	28
162.7	172.2	29	162.6	172.2	29
162.5	172.2	30	162.5	172.2	30
162.5	172.2	31	162.4	172.2	31
162.2	172.2	32	162.2	172.2	32
162.0	172.3	33	162.2	172.2	33

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
161.7	172.3	34	172.5	172.9	34
171.1	172.7	35	169.2	173.1	35
170.0	173.0	36	167.9	173.3	36
168.0	173.2	37	165.0	173.3	37
165.2	173.3	38	164.4	173.4	38
165.2	173.3	39	163.9	173.4	39
164.9	173.3	40	163.8	173.4	40
164.7	173.4	41	163.8	173.4	41
164.4	173.4	42	163.7	173.5	42
164.2	173.4	43	163.7	173.5	43
164.0	173.5	44	163.7	173.5	44
163.9	173.5	45	163.6	173.5	45
163.7	173.5	46	163.5	173.5	46
163.6	173.5	47	163.3	173.5	47
163.5	173.6	48	163.3	173.6	48
163.5	173.6	49	163.2	173.6	49
163.4	173.6	50	163.2	173.6	50
163.4	173.6	51	163.2	173.6	51
163.3	173.6	52	163.2	173.6	52
163.3	173.6	53	163.1	173.6	53
163.2	173.6	54	163.1	173.6	54
163.2	173.7	55	163.1	173.6	55
163.1	173.7	56	163.1	173.7	56
163.1	173.7	57	163.1	173.7	57
163.0	173.7	58	163.0	173.7	58
162.9	173.7	59	162.9	173.7	59
162.9	173.7	60	162.7	173.7	60
162.9	173.7	61	162.6	173.7	61
162.9	173.7	62	162.6	173.7	62
162.7	173.7	63	162.5	173.7	63
162.5	173.7	64	162.4	173.7	64
162.5	173.8	65	162.2	173.7	65
162.2	173.8	66	162.2	173.7	66
162.0	173.8	67	172.5	174.1	67
161.7	173.8	68	169.2	174.2	68
171.1	174.0	69	167.9	174.3	69

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
170.0	174.2	70	165.0	174.3	70
168.0	174.3	71	164.4	174.4	71
165.2	174.3	72	163.9	174.4	72
165.2	174.3	73	163.8	174.4	73
164.9	174.4	74	163.8	174.4	74
164.7	174.4	75	163.7	174.4	75
164.4	174.4	76	163.7	174.4	76
164.2	174.4	77	163.7	174.4	77
164.0	174.4	78	163.6	174.5	78
163.9	174.5	79	163.5	174.5	79
163.7	174.5	80	163.3	174.5	80
163.6	174.5	81	163.3	174.5	81
163.5	174.5	82	163.2	174.5	82
163.5	174.5	83	163.2	174.5	83
163.4	174.5	84	163.2	174.5	84
163.4	174.5	85	163.2	174.5	85
163.3	174.5	86	163.1	174.5	86
163.3	174.5	87	163.1	174.5	87
163.2	174.6	88	163.1	174.6	88
163.2	174.6	89	163.1	174.6	89
163.1	174.6	90	163.1	174.6	90
163.1	174.6	91	163.0	174.6	91
163.0	174.6	92	162.9	174.6	92
162.9	174.6	93	162.7	174.6	93
162.9	174.6	94	162.6	174.6	94
162.9	174.6	95	162.6	174.6	95
162.9	174.6	96	162.5	174.6	96
162.7	174.6	97	162.4	174.6	97
162.5	174.6	98	162.2	174.6	98
162.5	174.6	99	162.2	174.6	99
162.2	174.6	100	172.5	174.9	100
162.0	174.6	101	169.2	174.9	101
161.7	174.6	102	167.9	175.0	102
171.1	174.8	103	165.0	175.0	103
170.0	174.9	104	164.4	175.0	104
168.0	175.0	105	163.9	175.1	105

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
165.2	175.0	106	163.8	175.1	106
165.2	175.0	107	163.8	175.1	107
164.9	175.1	108	163.7	175.1	108
164.7	175.1	109	163.7	175.1	109
164.4	175.1	110	163.7	175.1	110
164.2	175.1	111	163.6	175.1	111
164.0	175.1	112	163.5	175.1	112
163.9	175.1	113	163.3	175.1	113
163.7	175.1	114	163.3	175.1	114
163.6	175.1	115	163.2	175.2	115
163.5	175.2	116	163.2	175.2	116
163.5	175.2	117	163.2	175.2	117
163.4	175.2	118	163.2	175.2	118
163.4	175.2	119	163.1	175.2	119
163.3	175.2	120	163.1	175.2	120
163.3	175.2	121	163.1	175.2	121
163.2	175.2	122	163.1	175.2	122
163.2	175.2	123	163.1	175.2	123
163.1	175.2	124	163.0	175.2	124
163.1	175.2	125	162.9	175.2	125
163.0	175.2	126	162.7	175.2	126
162.9	175.2	127	162.6	175.2	127
162.9	175.2	128	162.6	175.2	128
162.9	175.2	129	162.5	175.2	129
162.9	175.2	130	162.4	175.2	130
162.7	175.3	131	162.2	175.2	131
162.5	175.3	132	162.2	175.2	132
162.5	175.3	133	172.5	175.4	133
162.2	175.3	134	169.2	175.5	134
162.0	175.3	135	167.9	175.5	135
161.7	175.3	136	165.0	175.6	136
171.1	175.4	137	164.4	175.6	137
170.0	175.5	138	163.9	175.6	138
168.0	175.5	139	163.8	175.6	139
165.2	175.5	140	163.8	175.6	140
165.2	175.6	141	163.7	175.6	141

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
164.9	175.6	142	163.7	175.6	142
164.7	175.6	143	163.7	175.6	143
164.4	175.6	144	163.6	175.6	144
164.2	175.6	145	163.5	175.6	145
164.0	175.6	146	163.3	175.6	146
163.9	175.6	147	163.3	175.6	147
163.7	175.6	148	163.2	175.7	148
163.6	175.7	149	163.2	175.7	149
163.5	175.7	150	163.2	175.7	150
163.5	175.7	151	163.2	175.7	151
163.4	175.7	152	163.1	175.7	152
163.4	175.7	153	163.1	175.7	153
163.3	175.7	154	163.1	175.7	154
163.3	175.7	155	163.1	175.7	155
163.2	175.7	156	163.1	175.7	156
163.2	175.7	157	163.0	175.7	157
163.1	175.7	158	162.9	175.7	158
163.1	175.7	159	162.7	175.7	159
163.0	175.7	160	162.6	175.7	160
162.9	175.7	161	162.6	175.7	161
162.9	175.7	162	162.5	175.7	162
162.9	175.7	163	162.4	175.7	163
162.9	175.7	164	162.2	175.7	164
162.7	175.7	165	162.2	175.7	165
162.5	175.7	166	172.5	175.9	166
162.5	175.7	167	169.2	175.9	167
162.2	175.7	168	167.9	176.0	168
162.0	175.7	169	165.0	176.0	169
161.7	175.8	170	164.4	176.0	170
171.1	175.8	171	163.9	176.0	171
170.0	175.9	172	163.8	176.0	172
168.0	176.0	173	163.8	176.0	173
165.2	176.0	174	163.7	176.0	174
165.2	176.0	175	163.7	176.0	175
164.9	176.0	176	163.7	176.0	176
164.7	176.0	177	163.6	176.0	177

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
164.4	176.0	178	163.5	176.0	178
164.2	176.0	179	163.3	176.1	179
164.0	176.0	180	163.3	176.1	180
163.9	176.1	181	163.2	176.1	181
163.7	176.1	182	163.2	176.1	182
163.6	176.1	183	163.2	176.1	183
163.5	176.1	184	163.2	176.1	184
163.5	176.1	185	163.1	176.1	185
163.4	176.1	186	163.1	176.1	186
163.4	176.1	187	163.1	176.1	187
163.3	176.1	188	163.1	176.1	188
163.3	176.1	189	163.1	176.1	189
163.2	176.1	190	163.0	176.1	190
163.2	176.1	191	162.9	176.1	191
163.1	176.1	192	162.7	176.1	192
163.1	176.1	193	162.6	176.1	193
163.0	176.1	194	162.6	176.1	194
162.9	176.1	195	162.5	176.1	195
162.9	176.1	196	162.4	176.1	196
162.9	176.1	197	162.2	176.1	197
162.9	176.1	198	162.2	176.1	198
162.7	176.1	199	172.5	176.2	199
162.5	176.1	200	169.2	176.3	200
162.5	176.1	201	167.9	176.3	201
162.2	176.1	202	165.0	176.3	202
162.0	176.1	203	164.4	176.3	203
161.7	176.1	204	163.9	176.4	204
171.1	176.2	205	163.8	176.4	205
170.0	176.3	206	163.8	176.4	206
168.0	176.3	207	163.7	176.4	207
165.2	176.3	208	163.7	176.4	208
165.2	176.3	209	163.7	176.4	209
164.9	176.4	210	163.6	176.4	210
164.7	176.4	211	163.5	176.4	211
164.4	176.4	212	163.3	176.4	212
164.2	176.4	213	163.3	176.4	213

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
164.0	176.4	214	163.2	176.4	214
163.9	176.4	215	163.2	176.4	215
163.7	176.4	216	163.2	176.4	216
163.6	176.4	217	163.2	176.4	217
163.5	176.4	218	163.1	176.4	218
163.5	176.4	219	163.1	176.4	219
163.4	176.4	220	163.1	176.4	220
163.4	176.4	221	163.1	176.4	221
163.3	176.4	222	163.1	176.4	222
163.3	176.4	223	163.0	176.4	223
163.2	176.4	224	162.9	176.4	224
163.2	176.4	225	162.7	176.4	225
163.1	176.5	226	162.6	176.4	226
163.1	176.5	227	162.6	176.5	227
163.0	176.5	228	162.5	176.5	228
162.9	176.5	229	162.4	176.5	229
162.9	176.5	230	162.2	176.5	230
162.9	176.5	231	162.2	176.5	231
162.9	176.5	232	172.5	176.6	232
162.7	176.5	233	169.2	176.6	233
162.5	176.5	234	167.9	176.6	234
162.5	176.5	235	165.0	176.6	235
162.2	176.5	236	164.4	176.6	236
162.0	176.5	237	163.9	176.7	237
161.7	176.5	238	163.8	176.7	238
171.1	176.6	239	163.8	176.7	239
170.0	176.6	240	163.7	176.7	240
168.0	176.6	241	163.7	176.7	241
165.2	176.6	242	163.7	176.7	242
165.2	176.7	243	163.6	176.7	243
164.9	176.7	244	163.5	176.7	244
164.7	176.7	245	163.3	176.7	245
164.4	176.7	246	163.3	176.7	246
164.2	176.7	247	163.2	176.7	247
164.0	176.7	248	163.2	176.7	248
163.9	176.7	249	163.2	176.7	249

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
163.7	176.7	250	163.2	176.7	250
163.6	176.7	251	163.1	176.7	251
163.5	176.7	252	163.1	176.7	252
163.5	176.7	253	163.1	176.7	253
163.4	176.7	254	163.1	176.7	254
163.4	176.7	255	163.1	176.7	255
163.3	176.7	256	163.0	176.7	256
163.3	176.7	257	162.9	176.7	257
163.2	176.7	258	162.7	176.7	258
163.2	176.7	259	162.6	176.7	259
163.1	176.7	260	162.6	176.7	260
163.1	176.7	261	162.5	176.7	261
163.0	176.8	262	162.4	176.7	262
162.9	176.8	263	162.2	176.7	263
162.9	176.8	264	162.2	176.7	264
162.9	176.8	265	172.5	176.8	265
162.9	176.8	266	169.2	176.9	266
162.7	176.8	267	167.9	176.9	267
162.5	176.8	268	165.0	176.9	268
162.5	176.8	269	164.4	176.9	269
162.2	176.8	270	163.9	176.9	270
162.0	176.8	271	163.8	176.9	271
161.7	176.8	272	163.8	176.9	272
171.1	176.8	273	163.7	176.9	273
170.0	176.9	274	163.7	176.9	274
168.0	176.9	275	163.7	176.9	275
165.2	176.9	276	163.6	176.9	276
165.2	176.9	277	163.5	177.0	277
164.9	176.9	278	163.3	177.0	278
164.7	176.9	279	163.3	177.0	279
164.4	176.9	280	163.2	177.0	280
164.2	177.0	281	163.2	177.0	281
164.0	177.0	282	163.2	177.0	282
163.9	177.0	283	163.2	177.0	283
163.7	177.0	284	163.1	177.0	284
163.6	177.0	285	163.1	177.0	285

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
163.5	177.0	286	163.1	177.0	286
163.5	177.0	287	163.1	177.0	287
163.4	177.0	288	163.1	177.0	288
163.4	177.0	289	163.0	177.0	289
163.3	177.0	290	162.9	177.0	290
163.3	177.0	291	162.7	177.0	291
163.2	177.0	292	162.6	177.0	292
163.2	177.0	293	162.6	177.0	293
163.1	177.0	294	162.5	177.0	294
163.1	177.0	295	162.4	177.0	295
163.0	177.0	296	162.2	177.0	296
162.9	177.0	297	162.2	177.0	297
162.9	177.0	298	172.5	177.1	298

Appendix C.

Example 3, M4A2 data without secondary detonations

Table C-1.
Data for M4A2 charge for two measurent positions.

	Position 1				Position 2			
QE/AZ in mils	Peak level	B-duration in ms	HI in dB	ANR	Peak level	B-duration in ms	HI in dB	ANR
300/	169.1	36.5	164.2	364.0	168.4	41	163.8	430.5
Center	169.1	42.8	164.7	294.6	169.6	39.9	165.0	256.8
	169.7	37.7	164.9	264.5	167.8	39.9	163.2	588.4
	168.5	40	163.9	424.8	168.3	40.5	163.7	458.2
	167.3	43.7	162.9	656.5	168.7	37.4	163.9	423.6
800/	167.9	44.1	163.5	492.0	167.9	37.5	163.1	610.2
Center	167.5	43.5	163.1	602.4	168	44.6	163.7	462.9
	167.7	42.6	163.2	564.8	167.8	45.7	163.5	491.4
	167.1	46.3	162.9	666.6	167.7	43.4	163.3	551.0
	167.7	48.4	163.6	476.8	167.9	37.1	163.0	618.9
	166.9	46.7	162.7	722.6	167.4	38.5	162.6	741.8
1250/	166.7	38.9	162.0	1010.0	167.6	43.1	163.2	582.3
Center	166.5	44.9	162.2	915.3	168	43.8	163.6	474.1
	166.6	48.5	162.5	789.0	167.6	42.7	163.1	589.6
	166.8	45.1	162.5	792.5	167.7	42.6	163.2	564.8
	166.4	39.4	161.7	1140.1	167.7	40.4	163.1	606.0
300/	167.5	45.7	163.2	564.2	166.8	44.9	162.5	797.2
L350	169.3	47.8	165.2	232.0	167.8	49.9	163.8	437.2
	168.1	48.7	164.0	393.3	Lost			
	167.2	51.6	163.3	551.3	166.9	45.8	162.6	741.5
	169.8	40.6	165.2	228.9	167.4	45	163.1	603.0
800/	167.5	40.1	162.9	671.1	167.4	44.3	163.1	615.7
L350	167.5	46.6	163.3	549.7	166.9	46.4	162.7	728.8
	167.9	47.2	163.7	449.5	167.6	45.2	163.3	546.7
	168	42	163.5	501.3	168.1	43.5	163.7	456.9
	168	40.1	163.4	533.1	168.6	45.9	164.4	338.0
1250/	167.5	47.6	163.4	534.4	167.3	48.8	163.2	567.0
L350	167.4	44.2	163.0	617.5	166.8	42.8	162.4	849.6
	167.3	46.9	163.1	597.7	166.6	42.8	162.2	931.6
	167.4	42.3	162.9	654.6	167.3	43.1	162.9	668.6
	168.7	45.4	164.4	327.5	166.6	42.9	162.2	928.7
Average	167.8	44.1	163.4	567.2	167.7	43.0	163.2	588.7

Table C-2.

ANR, 1/ANR, and APDHI calculated from the M4A2 data rank ordered for increasing ANR.

Position 1				Position 2			
ANR	1/ANR	APDHI	N	ANR	1/ANR	APDHI	N
228.8	0.0044	0.0044	1	256.8	0.0039	0.0039	1
232.0	0.0043	0.0087	2	338.0	0.0030	0.0069	2
264.5	0.0038	0.0125	3	423.6	0.0024	0.0092	3
294.6	0.0034	0.0159	4	430.5	0.0023	0.0115	4
327.5	0.0031	0.0189	5	437.2	0.0023	0.0138	5
364.0	0.0027	0.0217	6	456.9	0.0022	0.0160	6
393.3	0.0025	0.0242	7	458.2	0.0022	0.0182	7
424.8	0.0024	0.0266	8	462.9	0.0022	0.0204	8
449.5	0.0022	0.0288	9	474.1	0.0021	0.0225	9
476.8	0.0021	0.0309	10	491.4	0.0020	0.0245	10
492.0	0.0020	0.0329	11	546.7	0.0018	0.0263	11
501.3	0.0020	0.0349	12	551.0	0.0018	0.0281	12
533.1	0.0019	0.0368	13	564.8	0.0018	0.0299	13
534.4	0.0019	0.0387	14	567.0	0.0018	0.0317	14
549.7	0.0018	0.0405	15	582.3	0.0017	0.0334	15
551.3	0.0018	0.0423	16	588.4	0.0017	0.0351	16
564.2	0.0018	0.0441	17	589.6	0.0017	0.0368	17
564.8	0.0018	0.0458	18	603.0	0.0017	0.0384	18
597.7	0.0017	0.0475	19	606.0	0.0017	0.0401	19
602.4	0.0017	0.0492	20	610.2	0.0016	0.0417	20
617.5	0.0016	0.0508	21	615.7	0.0016	0.0434	21
654.6	0.0015	0.0523	22	618.9	0.0016	0.0450	22
656.5	0.0015	0.0538	23	668.6	0.0015	0.0465	23
666.6	0.0015	0.0553	24	728.8	0.0014	0.0478	24
671.1	0.0015	0.0568	25	741.5	0.0013	0.0492	25
722.6	0.0014	0.0582	26	741.8	0.0013	0.0505	26
789.0	0.0013	0.0595	27	797.2	0.0013	0.0518	27
792.5	0.0013	0.0607	28	849.6	0.0012	0.0530	28
915.3	0.0011	0.0618	29	928.7	0.0011	0.0540	29
1010.0	0.0010	0.0628	30	931.6	0.0011	0.0551	30
1140.1	0.0009	0.0637	31				

Table C-3.
HI and AHI from M4A2 data rank ordered by descending HI.

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
165.2	165.2	1	165.0	165.0	1
165.2	166.7	2	164.4	166.2	2
164.9	167.5	3	163.9	166.8	3
164.7	168.0	4	163.8	167.3	4
164.4	168.4	5	163.8	167.7	5
164.2	168.7	6	163.7	168.0	6
164.0	168.9	7	163.7	168.3	7
163.9	169.1	8	163.7	168.5	8
163.7	169.3	9	163.6	168.7	9
163.6	169.4	10	163.5	168.9	10
163.5	169.5	11	163.3	169.1	11
163.5	169.7	12	163.3	169.2	12
163.4	169.8	13	163.2	169.4	13
163.4	169.9	14	163.2	169.5	14
163.3	170.0	15	163.2	169.6	15
163.3	170.1	16	163.2	169.7	16
163.2	170.2	17	163.1	169.8	17
163.2	170.3	18	163.1	169.9	18
163.1	170.3	19	163.1	170.0	19
163.1	170.4	20	163.1	170.1	20
163.0	170.5	21	163.1	170.2	21
162.9	170.5	22	163.0	170.2	22
162.9	170.6	23	162.9	170.3	23
162.9	170.7	24	162.7	170.4	24
162.9	170.7	25	162.6	170.4	25
162.7	170.8	26	162.6	170.5	26
162.5	170.8	27	162.5	170.5	27
162.5	170.8	28	162.4	170.6	28
162.2	170.9	29	162.2	170.6	29
162.0	170.9	30	162.2	170.7	30
161.7	170.9	31	165.0	170.8	31
165.2	171.1	32	164.4	170.9	32
165.2	171.2	33	163.9	171.0	33

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
164.9	171.3	34	163.8	171.1	34
164.7	171.4	35	163.8	171.1	35
164.4	171.5	36	163.7	171.2	36
164.2	171.6	37	163.7	171.3	37
164.0	171.6	38	163.7	171.3	38
163.9	171.7	39	163.6	171.4	39
163.7	171.7	40	163.5	171.5	40
163.6	171.8	41	163.3	171.5	41
163.5	171.8	42	163.3	171.6	42
163.5	171.9	43	163.2	171.6	43
163.4	171.9	44	163.2	171.6	44
163.4	172.0	45	163.2	171.7	45
163.3	172.0	46	163.2	171.7	46
163.3	172.0	47	163.1	171.8	47
163.2	172.1	48	163.1	171.8	48
163.2	172.1	49	163.1	171.9	49
163.1	172.1	50	163.1	171.9	50
163.1	172.2	51	163.1	171.9	51
163.0	172.2	52	163.0	172.0	52
162.9	172.2	53	162.9	172.0	53
162.9	172.3	54	162.7	172.0	54
162.9	172.3	55	162.6	172.1	55
162.9	172.3	56	162.6	172.1	56
162.7	172.4	57	162.5	172.1	57
162.5	172.4	58	162.4	172.1	58
162.5	172.4	59	162.2	172.1	59
162.2	172.4	60	162.2	172.2	60
162.0	172.4	61	165.0	172.2	61
161.7	172.4	62	164.4	172.3	62
165.2	172.5	63	163.9	172.3	63
165.2	172.6	64	163.8	172.4	64
164.9	172.6	65	163.8	172.4	65
164.7	172.7	66	163.7	172.5	66
164.4	172.7	67	163.7	172.5	67
164.2	172.8	68	163.7	172.5	68
164.0	172.8	69	163.6	172.6	69

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
163.9	172.8	70	163.5	172.6	70
163.7	172.9	71	163.3	172.6	71
163.6	172.9	72	163.3	172.7	72
163.5	172.9	73	163.2	172.7	73
163.5	173.0	74	163.2	172.7	74
163.4	173.0	75	163.2	172.7	75
163.4	173.0	76	163.2	172.8	76
163.3	173.0	77	163.1	172.8	77
163.3	173.1	78	163.1	172.8	78
163.2	173.1	79	163.1	172.8	79
163.2	173.1	80	163.1	172.9	80
163.1	173.1	81	163.1	172.9	81
163.1	173.2	82	163.0	172.9	82
163.0	173.2	83	162.9	172.9	83
162.9	173.2	84	162.7	173.0	84
162.9	173.2	85	162.6	173.0	85
162.9	173.2	86	162.6	173.0	86
162.9	173.2	87	162.5	173.0	87
162.7	173.3	88	162.4	173.0	88
162.5	173.3	89	162.2	173.0	89
162.5	173.3	90	162.2	173.0	90
162.2	173.3	91	165.0	173.1	91
162.0	173.3	92	164.4	173.1	92
161.7	173.3	93	163.9	173.2	93
165.2	173.4	94	163.8	173.2	94
165.2	173.4	95	163.8	173.2	95
164.9	173.4	96	163.7	173.2	96
164.7	173.5	97	163.7	173.3	97
164.4	173.5	98	163.7	173.3	98
164.2	173.5	99	163.6	173.3	99
164.0	173.6	100	163.5	173.3	100
163.9	173.6	101	163.3	173.4	101
163.7	173.6	102	163.3	173.4	102
163.6	173.6	103	163.2	173.4	103
163.5	173.7	104	163.2	173.4	104
163.5	173.7	105	163.2	173.4	105

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
163.4	173.7	106	163.2	173.5	106
163.4	173.7	107	163.1	173.5	107
163.3	173.7	108	163.1	173.5	108
163.3	173.8	109	163.1	173.5	109
163.2	173.8	110	163.1	173.5	110
163.2	173.8	111	163.1	173.6	111
163.1	173.8	112	163.0	173.6	112
163.1	173.8	113	162.9	173.6	113
163.0	173.8	114	162.7	173.6	114
162.9	173.8	115	162.6	173.6	115
162.9	173.9	116	162.6	173.6	116
162.9	173.9	117	162.5	173.6	117
162.9	173.9	118	162.4	173.7	118
162.7	173.9	119	162.2	173.7	119
162.5	173.9	120	162.2	173.7	120
162.5	173.9	121	165.0	173.7	121
162.2	173.9	122	164.4	173.7	122
162.0	173.9	123	163.9	173.8	123
161.7	173.9	124	163.8	173.8	124
165.2	174.0	125	163.8	173.8	125
165.2	174.0	126	163.7	173.8	126
164.9	174.0	127	163.7	173.8	127
164.7	174.1	128	163.7	173.9	128
164.4	174.1	129	163.6	173.9	129
164.2	174.1	130	163.5	173.9	130
164.0	174.1	131	163.3	173.9	131
163.9	174.2	132	163.3	173.9	132
163.7	174.2	133	163.2	173.9	133
163.6	174.2	134	163.2	174.0	134
163.5	174.2	135	163.2	174.0	135
163.5	174.2	136	163.2	174.0	136
163.4	174.2	137	163.1	174.0	137
163.4	174.2	138	163.1	174.0	138
163.3	174.3	139	163.1	174.0	139
163.3	174.3	140	163.1	174.0	140
163.2	174.3	141	163.1	174.1	141

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
163.2	174.3	142	163.0	174.1	142
163.1	174.3	143	162.9	174.1	143
163.1	174.3	144	162.7	174.1	144
163.0	174.3	145	162.6	174.1	145
162.9	174.4	146	162.6	174.1	146
162.9	174.4	147	162.5	174.1	147
162.9	174.4	148	162.4	174.1	148
162.9	174.4	149	162.2	174.1	149
162.7	174.4	150	162.2	174.2	150
162.5	174.4	151	165.0	174.2	151
162.5	174.4	152	164.4	174.2	152
162.2	174.4	153	163.9	174.2	153
162.0	174.4	154	163.8	174.2	154
161.7	174.4	155	163.8	174.3	155
165.2	174.5	156	163.7	174.3	156
165.2	174.5	157	163.7	174.3	157
164.9	174.5	158	163.7	174.3	158
164.7	174.5	159	163.6	174.3	159
164.4	174.5	160	163.5	174.3	160
164.2	174.6	161	163.3	174.4	161
164.0	174.6	162	163.3	174.4	162
163.9	174.6	163	163.2	174.4	163
163.7	174.6	164	163.2	174.4	164
163.6	174.6	165	163.2	174.4	165
163.5	174.6	166	163.2	174.4	166
163.5	174.7	167	163.1	174.4	167
163.4	174.7	168	163.1	174.4	168
163.4	174.7	169	163.1	174.5	169
163.3	174.7	170	163.1	174.5	170
163.3	174.7	171	163.1	174.5	171
163.2	174.7	172	163.0	174.5	172
163.2	174.7	173	162.9	174.5	173
163.1	174.7	174	162.7	174.5	174
163.1	174.7	175	162.6	174.5	175
163.0	174.7	176	162.6	174.5	176
162.9	174.8	177	162.5	174.5	177

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
162.9	174.8	178	162.4	174.5	178
162.9	174.8	179	162.2	174.5	179
162.9	174.8	180	162.2	174.6	180
162.7	174.8	181	165.0	174.6	181
162.5	174.8	182	164.4	174.6	182
162.5	174.8	183	163.9	174.6	183
162.2	174.8	184	163.8	174.6	184
162.0	174.8	185	163.8	174.6	185
161.7	174.8	186	163.7	174.7	186
165.2	174.8	187	163.7	174.7	187
165.2	174.9	188	163.7	174.7	188
164.9	174.9	189	163.6	174.7	189
164.7	174.9	190	163.5	174.7	190
164.4	174.9	191	163.3	174.7	191
164.2	174.9	192	163.3	174.7	192
164.0	175.0	193	163.2	174.7	193
163.9	175.0	194	163.2	174.8	194
163.7	175.0	195	163.2	174.8	195
163.6	175.0	196	163.2	174.8	196
163.5	175.0	197	163.1	174.8	197
163.5	175.0	198	163.1	174.8	198
163.4	175.0	199	163.1	174.8	199
163.4	175.0	200	163.1	174.8	200
163.3	175.0	201	163.1	174.8	201
163.3	175.1	202	163.0	174.8	202
163.2	175.1	203	162.9	174.8	203
163.2	175.1	204	162.7	174.8	204
163.1	175.1	205	162.6	174.9	205
163.1	175.1	206	162.6	174.9	206
163.0	175.1	207	162.5	174.9	207
162.9	175.1	208	162.4	174.9	208
162.9	175.1	209	162.2	174.9	209
162.9	175.1	210	162.2	174.9	210
162.9	175.1	211	165.0	174.9	211
162.7	175.1	212	164.4	174.9	212
162.5	175.1	213	163.9	174.9	213

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
162.5	175.1	214	163.8	174.9	214
162.2	175.1	215	163.8	175.0	215
162.0	175.2	216	163.7	175.0	216
161.7	175.2	217	163.7	175.0	217
165.2	175.2	218	163.7	175.0	218
165.2	175.2	219	163.6	175.0	219
164.9	175.2	220	163.5	175.0	220
164.7	175.2	221	163.3	175.0	221
164.4	175.2	222	163.3	175.0	222
164.2	175.3	223	163.2	175.0	223
164.0	175.3	224	163.2	175.1	224
163.9	175.3	225	163.2	175.1	225
163.7	175.3	226	163.2	175.1	226
163.6	175.3	227	163.1	175.1	227
163.5	175.3	228	163.1	175.1	228
163.5	175.3	229	163.1	175.1	229
163.4	175.3	230	163.1	175.1	230
163.4	175.3	231	163.1	175.1	231
163.3	175.3	232	163.0	175.1	232
163.3	175.4	233	162.9	175.1	233
163.2	175.4	234	162.7	175.1	234
163.2	175.4	235	162.6	175.1	235
163.1	175.4	236	162.6	175.2	236
163.1	175.4	237	162.5	175.2	237
163.0	175.4	238	162.4	175.2	238
162.9	175.4	239	162.2	175.2	239
162.9	175.4	240	162.2	175.2	240
162.9	175.4	241	165.0	175.2	241
162.9	175.4	242	164.4	175.2	242
162.7	175.4	243	163.9	175.2	243
162.5	175.4	244	163.8	175.2	244
162.5	175.4	245	163.8	175.2	245
162.2	175.4	246	163.7	175.3	246
162.0	175.4	247	163.7	175.3	247
161.7	175.4	248	163.7	175.3	248
165.2	175.5	249	163.6	175.3	249

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
165.2	175.5	250	163.5	175.3	250
164.9	175.5	251	163.3	175.3	251
164.7	175.5	252	163.3	175.3	252
164.4	175.5	253	163.2	175.3	253
164.2	175.5	254	163.2	175.3	254
164.0	175.5	255	163.2	175.3	255
163.9	175.6	256	163.2	175.3	256
163.7	175.6	257	163.1	175.4	257
163.6	175.6	258	163.1	175.4	258
163.5	175.6	259	163.1	175.4	259
163.5	175.6	260	163.1	175.4	260
163.4	175.6	261	163.1	175.4	261
163.4	175.6	262	163.0	175.4	262
163.3	175.6	263	162.9	175.4	263
163.3	175.6	264	162.7	175.4	264
163.2	175.6	265	162.6	175.4	265
163.2	175.6	266	162.6	175.4	266
163.1	175.6	267	162.5	175.4	267
163.1	175.6	268	162.4	175.4	268
163.0	175.7	269	162.2	175.4	269
162.9	175.7	270	162.2	175.4	270
162.9	175.7	271	165.0	175.4	271
162.9	175.7	272	164.4	175.5	272
162.9	175.7	273	163.9	175.5	273
162.7	175.7	274	163.8	175.5	274
162.5	175.7	275	163.8	175.5	275
162.5	175.7	276	163.7	175.5	276
162.2	175.7	277	163.7	175.5	277
162.0	175.7	278	163.7	175.5	278
161.7	175.7	279	163.6	175.5	279
165.2	175.7	280	163.5	175.5	280
165.2	175.7	281	163.3	175.5	281
164.9	175.7	282	163.3	175.6	282
164.7	175.8	283	163.2	175.6	283
164.4	175.8	284	163.2	175.6	284
164.2	175.8	285	163.2	175.6	285

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
164.0	175.8	286	163.2	175.6	286
163.9	175.8	287	163.1	175.6	287
163.7	175.8	288	163.1	175.6	288
163.6	175.8	289	163.1	175.6	289
163.5	175.8	290	163.1	175.6	290
163.5	175.8	291	163.1	175.6	291
163.4	175.8	292	163.0	175.6	292
163.4	175.8	293	162.9	175.6	293
163.3	175.9	294	162.7	175.6	294
163.3	175.9	295	162.6	175.6	295
163.2	175.9	296	162.6	175.6	296
163.2	175.9	297	162.5	175.6	297
163.1	175.9	298	162.4	175.7	298
163.1	175.9	299	162.2	175.7	299
163.0	175.9	300	162.2	175.7	300
162.9	175.9	301	165.0	175.7	301
162.9	175.9	302	164.4	175.7	302
162.9	175.9	303	163.9	175.7	303
162.9	175.9	304	163.8	175.7	304
162.7	175.9	305	163.8	175.7	305
162.5	175.9	306	163.7	175.7	306
162.5	175.9	307	163.7	175.7	307
162.2	175.9	308	163.7	175.7	308
162.0	175.9	309	163.6	175.7	309
161.7	175.9	310	163.5	175.8	310
165.2	175.9	311	163.3	175.8	311
165.2	176.0	312	163.3	175.8	312
164.9	176.0	313	163.2	175.8	313
164.7	176.0	314	163.2	175.8	314
164.4	176.0	315	163.2	175.8	315
164.2	176.0	316	163.2	175.8	316
164.0	176.0	317	163.1	175.8	317
163.9	176.0	318	163.1	175.8	318
163.7	176.0	319	163.1	175.8	319
163.6	176.0	320	163.1	175.8	320
163.5	176.0	321	163.1	175.8	321

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
163.5	176.0	322	163.0	175.8	322
163.4	176.1	323	162.9	175.8	323
163.4	176.1	324	162.7	175.8	324
163.3	176.1	325	162.6	175.8	325
163.3	176.1	326	162.6	175.9	326
163.2	176.1	327	162.5	175.9	327
163.2	176.1	328	162.4	175.9	328
163.1	176.1	329	162.2	175.9	329
163.1	176.1	330	162.2	175.9	330
163.0	176.1	331	165.0	175.9	331
162.9	176.1	332	164.4	175.9	332
162.9	176.1	333	163.9	175.9	333
162.9	176.1	334	163.8	175.9	334
162.9	176.1	335	163.8	175.9	335
162.7	176.1	336	163.7	175.9	336
162.5	176.1	337	163.7	175.9	337
162.5	176.1	338	163.7	175.9	338
162.2	176.1	339	163.6	175.9	339
162.0	176.1	340	163.5	176.0	340
161.7	176.1	341	163.3	176.0	341
165.2	176.2	342	163.3	176.0	342
165.2	176.2	343	163.2	176.0	343
164.9	176.2	344	163.2	176.0	344
164.7	176.2	345	163.2	176.0	345
164.4	176.2	346	163.2	176.0	346
164.2	176.2	347	163.1	176.0	347
164.0	176.2	348	163.1	176.0	348
163.9	176.2	349	163.1	176.0	349
163.7	176.2	350	163.1	176.0	350
163.6	176.2	351	163.1	176.0	351
163.5	176.2	352	163.0	176.0	352
163.5	176.2	353	162.9	176.0	353
163.4	176.2	354	162.7	176.0	354
163.4	176.3	355	162.6	176.0	355
163.3	176.3	356	162.6	176.0	356
163.3	176.3	357	162.5	176.0	357

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
163.2	176.3	358	162.4	176.1	358
163.2	176.3	359	162.2	176.1	359
163.1	176.3	360	162.2	176.1	360
163.1	176.3	361	165.0	176.1	361
163.0	176.3	362	164.4	176.1	362
162.9	176.3	363	163.9	176.1	363
162.9	176.3	364	163.8	176.1	364
162.9	176.3	365	163.8	176.1	365
162.9	176.3	366	163.7	176.1	366
162.7	176.3	367	163.7	176.1	367
162.5	176.3	368	163.7	176.1	368
162.5	176.3	369	163.6	176.1	369
162.2	176.3	370	163.5	176.1	370
162.0	176.3	371	163.3	176.1	371
161.7	176.3	372	163.3	176.1	372
165.2	176.3	373	163.2	176.2	373
165.2	176.4	374	163.2	176.2	374
164.9	176.4	375	163.2	176.2	375
164.7	176.4	376	163.2	176.2	376
164.4	176.4	377	163.1	176.2	377
164.2	176.4	378	163.1	176.2	378
164.0	176.4	379	163.1	176.2	379
163.9	176.4	380	163.1	176.2	380
163.7	176.4	381	163.1	176.2	381
163.6	176.4	382	163.0	176.2	382
163.5	176.4	383	162.9	176.2	383
163.5	176.4	384	162.7	176.2	384
163.4	176.4	385	162.6	176.2	385
163.4	176.4	386	162.6	176.2	386
163.3	176.4	387	162.5	176.2	387
163.3	176.4	388	162.4	176.2	388
163.2	176.4	389	162.2	176.2	389
163.2	176.5	390	162.2	176.2	390
163.1	176.5	391	165.0	176.2	391
163.1	176.5	392	164.4	176.3	392
163.0	176.5	393	163.9	176.3	393

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
162.9	176.5	394	163.8	176.3	394
162.9	176.5	395	163.8	176.3	395
162.9	176.5	396	163.7	176.3	396
162.9	176.5	397	163.7	176.3	397
162.7	176.5	398	163.7	176.3	398
162.5	176.5	399	163.6	176.3	399
162.5	176.5	400	163.5	176.3	400
162.2	176.5	401	163.3	176.3	401
162.0	176.5	402	163.3	176.3	402
161.7	176.5	403	163.2	176.3	403
165.2	176.5	404	163.2	176.3	404
165.2	176.5	405	163.2	176.3	405
164.9	176.5	406	163.2	176.3	406
164.7	176.5	407	163.1	176.3	407
164.4	176.5	408	163.1	176.3	408
164.2	176.6	409	163.1	176.3	409
164.0	176.6	410	163.1	176.4	410
163.9	176.6	411	163.1	176.4	411
163.7	176.6	412	163.0	176.4	412
163.6	176.6	413	162.9	176.4	413
163.5	176.6	414	162.7	176.4	414
163.5	176.6	415	162.6	176.4	415
163.4	176.6	416	162.6	176.4	416
163.4	176.6	417	162.5	176.4	417
163.3	176.6	418	162.4	176.4	418
163.3	176.6	419	162.2	176.4	419
163.2	176.6	420	162.2	176.4	420
163.2	176.6	421	165.0	176.4	421
163.1	176.6	422	164.4	176.4	422
163.1	176.6	423	163.9	176.4	423
163.0	176.6	424	163.8	176.4	424
162.9	176.6	425	163.8	176.4	425
162.9	176.6	426	163.7	176.4	426
162.9	176.6	427	163.7	176.4	427
162.9	176.6	428	163.7	176.4	428
162.7	176.6	429	163.6	176.5	429

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
162.5	176.7	430	163.5	176.5	430
162.5	176.7	431	163.3	176.5	431
162.2	176.7	432	163.3	176.5	432
162.0	176.7	433	163.2	176.5	433
161.7	176.7	434	163.2	176.5	434
165.2	176.7	435	163.2	176.5	435
165.2	176.7	436	163.2	176.5	436
164.9	176.7	437	163.1	176.5	437
164.7	176.7	438	163.1	176.5	438
164.4	176.7	439	163.1	176.5	439
164.2	176.7	440	163.1	176.5	440
164.0	176.7	441	163.1	176.5	441
163.9	176.7	442	163.0	176.5	442
163.7	176.7	443	162.9	176.5	443
163.6	176.7	444	162.7	176.5	444
163.5	176.7	445	162.6	176.5	445
163.5	176.7	446	162.6	176.5	446
163.4	176.7	447	162.5	176.5	447
163.4	176.8	448	162.4	176.5	448
163.3	176.8	449	162.2	176.5	449
163.3	176.8	450	162.2	176.5	450
163.2	176.8	451	165.0	176.6	451
163.2	176.8	452	164.4	176.6	452
163.1	176.8	453	163.9	176.6	453
163.1	176.8	454	163.8	176.6	454
163.0	176.8	455	163.8	176.6	455
162.9	176.8	456	163.7	176.6	456
162.9	176.8	457	163.7	176.6	457
162.9	176.8	458	163.7	176.6	458
162.9	176.8	459	163.6	176.6	459
162.7	176.8	460	163.5	176.6	460
162.5	176.8	461	163.3	176.6	461
162.5	176.8	462	163.3	176.6	462
162.2	176.8	463	163.2	176.6	463
162.0	176.8	464	163.2	176.6	464
161.7	176.8	465	163.2	176.6	465

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
165.2	176.8	466	163.2	176.6	466
165.2	176.8	467	163.1	176.6	467
164.9	176.8	468	163.1	176.6	468
164.7	176.8	469	163.1	176.6	469
164.4	176.9	470	163.1	176.6	470
164.2	176.9	471	163.1	176.7	471
164.0	176.9	472	163.0	176.7	472
163.9	176.9	473	162.9	176.7	473
163.7	176.9	474	162.7	176.7	474
163.6	176.9	475	162.6	176.7	475
163.5	176.9	476	162.6	176.7	476
163.5	176.9	477	162.5	176.7	477
163.4	176.9	478	162.4	176.7	478
163.4	176.9	479	162.2	176.7	479
163.3	176.9	480	162.2	176.7	480
163.3	176.9	481	165.0	176.7	481
163.2	176.9	482	164.4	176.7	482
163.2	176.9	483	163.9	176.7	483
163.1	176.9	484	163.8	176.7	484
163.1	176.9	485	163.8	176.7	485
163.0	176.9	486	163.7	176.7	486
162.9	176.9	487	163.7	176.7	487
162.9	176.9	488	163.7	176.7	488
162.9	176.9	489	163.6	176.7	489
162.9	176.9	490	163.5	176.7	490
162.7	176.9	491	163.3	176.7	491
162.5	176.9	492	163.3	176.7	492
162.5	176.9	493	163.2	176.8	493
162.2	176.9	494	163.2	176.8	494
162.0	177.0	495	163.2	176.8	495
161.7	177.0	496	163.2	176.8	496
			163.1	176.8	497
			163.1	176.8	498
			163.1	176.8	499
			163.1	176.8	500
			163.1	176.8	501

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
			163.0	176.8	502
			162.9	176.8	503
			162.7	176.8	504
			162.6	176.8	505
			162.6	176.8	506
			162.5	176.8	507
			162.4	176.8	508
			162.2	176.8	509
			162.2	176.8	510
			165.0	176.8	511
			164.4	176.8	512
			163.9	176.8	513
			163.8	176.8	514
			163.8	176.8	515
			163.7	176.8	516
			163.7	176.9	517
			163.7	176.9	518
			163.6	176.9	519
			163.5	176.9	520
			163.3	176.9	521
			163.3	176.9	522
			163.2	176.9	523
			163.2	176.9	524
			163.2	176.9	525
			163.2	176.9	526
			163.1	176.9	527
			163.1	176.9	528
			163.1	176.9	529
			163.1	176.9	530
			163.1	176.9	531
			163.0	176.9	532
			162.9	176.9	533
			162.7	176.9	534
			162.6	176.9	535
			162.6	176.9	536
			162.5	176.9	537

Position 1			Position 2		
HI in dB	AHI in dB	N	HI in dB	AHI in dB	N
			162.4	176.9	538
			162.2	176.9	539
			162.2	176.9	540
			165.0	176.9	541
			164.4	177.0	542
			163.9	177.0	543